The Effect of Personal Income Taxes on Inflation: Evidence from U.S. States*

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Abstract

This paper studies the effect of taxes for different income groups on inflation. Using a difference-in-differences approach, I compare states that enact large tax changes to states that do not have personal taxes from 1978 to 2017. I find tax cuts are inflationary. A 1 percentage point decrease in the state income average tax rate for lower-income groups increases prices by 2.5 percent, while a 1 percentage point decrease for higher-income groups increases prices by 1.5 percent. My results suggest the positive relationship between tax cuts and price growth is largely driven by consumer demand and employment growth.

I INTRODUCTION

The effect of tax changes on inflation are actively debated. Several U.S. states implemented income tax cuts to provide relief to households during the latest inflationary episode. However, critics worry that these tax cuts may exacerbate inflation; economic theory predicts that tax cuts stimulate consumer spending by transferring money to households, and in turn, increase prices. Understanding the effects of personal income tax changes on inflation, and how effects may vary across different income groups, is crucial for making informed fiscal policy decisions.

There are several empirical challenges to studying the relationship between tax policy and inflation. First, there have been few *federal* tax changes in recent years in the U.S., making it difficult to draw meaningful conclusions from federal data. Second,

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while tax policies of U.S. *states* exhibit significant variation in the past decades, accurately measuring local price indices over a long historical period has been a challenge. Past studies have relied on imperfect regional price indices, which impute missing data from other regions (Moretti, 2013; Nakamura and Steinsson, 2014; Zidar, 2019). Finally, governments often change tax policies in anticipation of economic conditions, making it difficult to isolate the impact of tax changes on inflation.

This paper exploits *state* income tax changes in the United States from 1978 to 2017 to study the effect of personal income tax changes on inflation. State tax policy variation presents a natural laboratory for studying the impact of tax changes on inflation, as some states have introduced many personal income tax changes on top or lower-income earners, while other states do not have personal income taxes. I use a novel measure of state-level tradable and non-tradable price indices from Hazell et al. (2022). The indices are constructed from the underlying price data used to calculate the national consumer price index (CPI), so do not rely on regional imputation. I supplement the indices, which do not include housing costs, with the state-level house price index from the Federal Housing Finance Agency (FHFA). To examine the plausibility of my findings, I present results using other price indices from the American Chamber of Commerce Research Association (ACCRA), Bureau of Labor Studies (BLS), and Bureau of Economic Analysis (BEA).

Using a difference-in-differences approach, I compare treated states that implement large personal income tax changes to control states with no personal income taxes during the same period. To account for the heterogeneous effects of tax changes on economic activity across income groups, I separately analyze tax shocks for households in the top 10 and bottom 90 percentiles of the income distribution. The contribution of this paper is to leverage tax variation for different income groups and a new measure of state prices to estimate the impact of taxes on inflation.

I find tax cuts are inflationary. A 1 standard deviation, or 2 percentage point, decrease in state income average tax rates for the bottom 90 percent leads to 1.5 percent higher non-tradable prices, no change in tradable prices, and 15 percent higher house prices over a 4-year period after the tax change. This translates into an average tax rate cut of 1 percentage point for the bottom 90 percent increasing aggregate prices by approximately 2.5 percent.[1] Similarly, tax cuts for the top 10 percent increase house prices by 10 percent, and have no detectable impact on non-tradable or tradable prices. A 1 percentage point tax rate cut for the top 10 percent translates into an increase of aggregate prices by 1.5 percent. Since housing is a leveraged asset, house prices appear sensitive to households' increased ability-to-pay following tax cuts for both higher-income and lower-income households.

In terms of mechanisms, I show how tax changes for different income groups affect labor market outcomes, consumption, and migration. Specifically, 1 standard deviation decreases in the average tax rates for lower-income and top-income households increase employment by 2.5 percent and 1 percent, respectively. Hours worked increase by 1 percent and wages increase by 5 percent for both income groups. Higher wages following state tax cuts suggest that labor demand outweighs supply responses as a mechanism for these results. Migration responses are small; the migration rate increases by 0.3 percentage points following tax cuts for lower-income households and does not change following tax cuts for higher-income households. These results suggest price responses to tax cuts are largely driven by increased consumer demand and employment growth.

To address endogeneity concerns, I adopt the narrative approach in the spirit of Romer and Romer (2010) to identify tax changes that are unlikely to be responding to changing economic conditions, as they were passed to address an existing budget deficit or achieve a long-run goal. Focusing on a subset of taxes classified as "exogenous", I find evidence in support of my finding that tax cuts increase aggregate prices.

I leverage *federal* income tax shocks to further explore the mechanisms behind price responses. State tax shocks may induce cross-state spillovers such as migration across states, whereas federal tax shocks apply to individuals in all states. To identify exogenous federal tax shocks, I use variation in the income distribution across U.S. states over time to measure heterogeneous state exposure to federal tax policy changes, following Zidar (2019). Using a direct projection approach with year-state-income-group-level tax shocks, I estimate the dynamic effects of federal tax policy changes on prices for the top 10 and bottom 90 percent income households. I find a 1 percent of

[1] Non-tradables, tradables, and housing each account for roughly one-third of the total CPI. Taking a weighted average, this effect translates into a 1 standard deviation, or 2 percentage point, decrease in average tax rates increasing aggregate prices by approximately $\frac{1}{3} \cdot 1.5 + \frac{1}{3} \cdot 0 + \frac{1}{3} \cdot 15 = 5$ percent.

state GDP tax cut for the bottom 90 percent results in 5 percent growth in non-tradable prices, no significant growth in tradable prices, and 10 percent growth in house prices, leading to aggregate price growth of 5 percent. Following a 1 percent of state GDP tax cut for the bottom 90 percent, employment increases by 10 percent, consumption increases by 5 percent, and GDP increases by 10 percent. Lower wages following federal tax cuts suggest labor supply outweighs demand responses. A 1 percent of state GDP tax cut for the top 10 percent has no impact on aggregate inflation.

This paper relates to the literature on the effectiveness of taxes as a tool to control inflation (Eisner, 1969; Hansen, 1971; Blinder, 1973; Turnovsky, 1974), which questions the conventional macroeconomic theory prediction that a decrease in taxes increases demand and will thus be inflationary. Hansen (1971) suggests tax cuts increase after-tax income and decrease household demand for money, lowering prices, while Blinder (1973) argues that lower taxes increase incentives to work, so increased labor supply would place downward pressure on wages and prices. Up until now, the literature has been largely theoretical. My contribution is to empirically test conventional macroeconomic theory. I find price responses to taxation for lower-income groups are primarily driven by the direct effect of lower taxes on increasing demand and employment, outweighing the effects posited by Hansen (1971) and Blinder (1973).

This paper's findings are within the range predicted by the Phillips curve literature. The New Keynesian Phillips curve is often written as follows:

$$\pi_t = \beta E_t \pi_{t+1} - \kappa(u_t(\tau_t) - u_t^n) + \eta_t \tag{1}$$

where inflation π_t is a function of expected inflation $\beta E_t \pi_{t+1}$, the output gap $u_t - u_t^n$, and shocks η_t. The output gap is measured as the difference between unemployment $u_t(\tau_t)$, a function of taxes τ, and the natural rate of unemployment u_t^n. The correlation between the unemployment gap and inflation κ is estimated as being equal to 0.0062 by Hazell et al. (2022) and 0.03 by Stock and Watson (2020). I find a 1 standard deviation decrease in taxes for the bottom 90 percent decreases the unemployment rate by roughly 2.5 percent. Based on the estimates from the empirical Phillips curve literature, a 2.5 percent decrease in the unemployment rate is associated with inflation of 1.5 ($\approx 2.5 \cdot 0.0062$) to 7.5 ($\approx 2.5 \cdot 0.03$) percent. My finding that a tax cut that decreases the unemployment gap by 2.5 percent will generate inflation of 5 percent lines up with these predictions generated from the literature. Together, my estimate of unemployment rate effects and and the recent Phillips curve parameter estimates corroborate the credibility of my main inflation findings.

The literature linking tax policy to labor supply and consumption is consistent with the possibility of heterogeneous effects of tax changes on inflation. Studies show lower-earning households increased labor force participation following the Earned Income Tax Credit (Eissa and Liebman, 1996; Meyer and Rosenbaum, 2001), while top-earning households exhibit limited labor supply responses to taxes (Saez et al., 2012; Romer and Romer, 2014). Further, the evidence suggests top-earnings households tend to have lower marginal propensities to consume than lower-earning households (McCarthy, 1995; Parker, 1999; Dynan et al., 2004; Jappelli and Pistaferri, 2010; Parker et al., 2013).

Methodologically, my approach is closely related to Giroud and Rauh (2019) who leverage *state* tax shocks in a difference-in-differences model to study the effect of taxes on business activity. My analysis also linked to Mertens and Ravn (2013), who use the Romer and Romer (2010) narrative approach, and Zidar (2019), who exploits regional heterogeneity of income distribution, to study exogenous *federal* tax shocks on economic activity. Leveraging a better set of local price indices helps to advance this literature.

II DATA ON INFLATION, ECONOMIC ACTIVITY, AND TAX CHANGES

II.A State Inflation and Other Non-tax Variables

The measure for state price indices is based on Hazell et al. (2022). Past research relies on indices where missing data is imputed from other regions, such as the metropolitan-level BLS price indices and ACCRA cost of living estimates (Moretti, 2013; Nakamura and Steinsson, 2014; Zidar, 2019). Hazell et al. (2022) improve on past indices by constructing a novel state-level inflation rate measure using underlying price data from the BLS CPI Research Database.[2] I convert the inflation rates to price indices with 1989 as the base year. Due to lack of full geographic coverage in the underlying price data over time, the indices are available for an unbalanced panel of 34 states from 1978 to 2017, and separate measures are available for the non-tradable and tradable sectors. Since tradable industries can reallocate their goods, we do not expect tradable prices to respond to local tax shocks. I use the FHFA's state house price index to supplement the Hazell et al. (2022) measures, which do not include the shelter component of the CPI. Non-tradables, tradables, and housing costs each account for roughly one-third of the total CPI.

To understand mechanisms, I examine various measures of economic activity. To study consumer demand, I collect personal consumption expenditures from the BEA for the period between 1997 and 2017 . To assess migration patterns, I analyze net migration data from the Internal Revenue Service (IRS) Statistics of Income (SOI) state-to-state migration data spanning from 1990 to 2017. To study extensive margin labor responses, I use state employment and population counts from the BLS to calculate the employment-to-population ratio for each state from 1978 to 2017. To study intensive margin labor responses, I examine hours worked and real wages from the Current Population Survey (CPS). Hours worked are calculated for employed residents aged 25 to 60 who have worked at least 48 weeks in the past year. Real wages are calculated as wages divided by hours worked by full-time workers, and are composition-constant to remove the influence of compositional changes of labor market participants on average wages.[3] To measure income, I use state gross domestic product (GDP) from the BEA for the period between 1978 and 2017. Additionally, I control for the unemployment rate, per capita income, and population at the state level from 1978 to 2017, obtained from the BLS and BEA. State tax revenues and expenditures are collected from the Census of Governments (CoGs) from 1978 to 2017.

[2]See Hazell et al. (2022) for a detailed description of their index construction procedure.

[3]The method to construct composition-constant wages follows the approach of Busso et al. (2013), Suárez Serrato and Zidar (2016), and Zidar (2019).

II.B State and Federal Tax Changes

To calculate state income tax rates, I use the NBER's Tax Simulator TAXSIM, a program that calculates individual tax liabilities based on annual tax schedules. To study the heterogeneous effects of tax changes, I simulate state tax liabilities for two representative individuals: one with the average income of the bottom 90 percent and the other with the average income of the top 10 percent of the federal pre-tax income distribution.[4] I compute the annual income tax rate as the state tax liabilities as a percentage of pre-tax income for the two earner types (bottom 90 versus top 10) in each state and year from 1977 to 2019.

I identify treated states as those that changed their personal income average tax rates by at least 2 percentage points (a 7 percent change). Treated states, in table 1, collect $1,500 per capita in personal income taxes. A 2 percentage point or higher average tax rate increase is equivalent to a $105 ($\approx 1,500 \cdot 7\%$) per capita or higher increase in tax revenues. These large tax changes, which I refer to as "treatments," occurred 70 times in 20 states for the bottom 90 percent and 36 times in 17 states for the top 10 percent during the sample period. I restrict the observation window for 3 years before and 4 years after the treatment. I identify 5 control states for each treatment, Alaska, Florida, Tennessee, Texas, and Washington, which have no income taxes during the observation period.

Table 1 shows summary statistics, by tax changes for the bottom 90 and top 10 percent income groups. For tax changes affecting the bottom 90 percent, the sample covers 1,454 state-year observations. Treated states have lower levels of in-migration, GDP per capita, smaller populations, rely more on income taxes to raise revenues and have lower government expenditures compared to control states. For tax changes affecting the top 10 percent, the sample covers 534 state-year observations. Treated states have less in-migration and smaller populations, but similar average household incomes to control states.

Figure 1 depicts the evolution of personal income average tax rates for the bottom 90 and top 10 percent over time. Panel A shows personal income tax rates for the bot-

[4] Pre-tax distributional income data for working-age individuals aged 20 to 64 comes from realtimeinequality.org, using publicly available data in Blanchet, Saez, and Zucman (2022). I assume that the individual is a single filer and has no dependents.

tom 90 percent rose in the 1980s and 1990s and remained stable in the 2000s, becoming more compressed during this period. Panel B shows a similar pattern for average tax rates of the top 10 percent. Panels C and D show the number of tax rate increases and decreases by year. Panel C shows increases in tax rates for the bottom 90 percent were common in the 1980s, while decreases were more common in the late 1990s and after 2000. Panel D shows tax changes for the top 10 percent occurred in the 1980s, early 1990 and 2010s.

I study the effect of federal income tax shocks to further explore mechanisms. I use exogenous state-level exposure measures of federal tax changes from Zidar (2019), based on variation in the income distribution across U.S. states over time.[5] The state-level exposure measure to a tax change $T^{g}_{s,t}$ is calculated as the sum of mechanical changes in tax liability for all residents in state s, income group $g \in \{\text{Bottom 90}, \text{Top 10}\}$, and year t, as a share of state GDP.

III ECONOMETRIC METHODS

III.A The Effects of State Tax Changes for Different Income Groups: Difference-in-Differences Model

I measure the effect of state income tax changes on local prices, using specifications at the state-year level for a sample of 3,237 state-year observations. The main treatment event is a large change to the state income average tax rate of 2 percentage points or more, where control states are states with no personal taxes during the sample period. I identify changes separately for bottom 90 and top 10 percent households. I estimate the following stacked difference-in-differences specification:

$$ln(y^{h}_{s,t}) = \alpha_0 + \sum_{j=3,\neq -1}^{4} \beta^{g}_{j} \Delta \text{tax}^{g}_{s} \times \mathbf{1}_{\{P_t = j\}} + \boldsymbol{X}'_{s,t}\boldsymbol{\Gamma} + \delta_t + \theta_s + \varepsilon_{s,t} \tag{2}$$

where s and t index state and year. $ln(y^{h}_{s,t})$ is the log of the state economic activity outcome of interest. $\Delta \text{tax}^{g}_{s}$ measures a 1 standard deviation, or a 2 percentage point,

[5] See Zidar (2019) for detailed description of construction of the state-level exposure measure to federal tax changes.

change of the average tax rate, where $g \in \{\text{Bottom 90}, \text{Top 10}\}$ indexes the income group.[6] Δtax_s^g is equal to 0 for control states which do not have personal income taxes. $\mathbf{1}_{\{P_t = j\}}$ is an indicator that is equal to 1 if t is j years away from the treatment year. I restrict the observation window to 3 years before and 4 years after the treatment, and omit the period prior to tax change, $\beta_{j=-1}$, so that the other β_j's can be interpreted relative to this pre-tax shock baseline period. $\boldsymbol{X}'_{s,t}$ is a vector of state and year-level controls, including the unemployment rate, per capita income, GDP, and state population. I include year fixed effects δ_t to absorb changes in long-run monetary regimes, such as inflation expectations, thereby isolating the effect of taxes on inflation as mediated by consumption responses. State fixed effects θ_s control for time-invariant factors driving inflation in each state.

The β_j^g coefficients for $j \in [0, 4]$ are interpreted as the percent change in $y_{i,t}$ in response to a 1 standard deviation, or 2 percentage point, increase in the state average income tax rate for income group g, relative to states with no tax shocks. The expected sign of these coefficients is negative, as tax increases lower consumer demand, and in turn lower prices.

The identifying assumption necessary for a causal interpretation is that state tax shocks are exogenous. The assumption requires that policy makers are not systematically setting tax rates in response to idiosyncratic state economic conditions or contemporaneously with other policies that affect inflation. In other words, in the absence of the tax change, outcomes for treated and control states would have evolved in parallel. To provide support for this "parallel trends" assumption in this difference-in-difference specification, I show that the path of outcomes for treated and control states are virtually identical in the pre-tax change period.

As a further robustness check, I restrict to a smaller sample of "exogenous" state income tax changes. Romer and Romer (2010) distinguishes between two categories of tax changes: endogenous taxes that offset a change in government spending or some other factor likely to affect output in the near term, and exogenous taxes that are due to inherited budget deficits or a long-term goal, such as higher aggregate growth. I search major newspaper databases to categorize state tax changes, based on the Romer and

[6]For a tax shock that affects the bottom 90 percent and increases the average tax rate from 2 to 6 percent in state s, $\Delta \text{tax}_s^{B90}$ is equal to 4 percentage points divided by the standard deviation of all tax shocks in the sample.

Romer (2010) categories.[7] Out of the 70 tax changes for the bottom 90, 6 are categorized as exogenous, 63 are unclassified and 1 is endogenous. Out of the 36 tax changes for the top 10, 12 are exogenous, 13 are unclassified and 1 is endogenous. I estimate a variant of baseline specification (1) in which I only keep exogenous or unclassified tax shocks in my estimation sample. Given the small number of classified taxes, I consider this a useful robustness test, but rely on the difference-in-difference results from the main sample to draw conclusions.

III.B The Effects of Federal Tax Changes for Different Income Groups: Direct Projection Model

To examine the path of local prices in response to federal income tax changes for the bottom 90 and top 10 percent, I estimate the following direct projection regression:

$$ln(y^h_{s,t+h}) - ln(y^h_{s,t+h}) = \beta^{B90}_h T^{B90}_{s,t} + \beta^{T10}_h T^{T10}_{s,t} + \boldsymbol{X}'_{s,t}\boldsymbol{\Gamma}_h + \delta_{t,h} + \theta_{s,h} + \varepsilon_{s,t,h} \quad (3)$$

where s and t index state and year, for $h \in \{-3, -2, \ldots, 4\}$. $ln(y^h_{s,t+h}) - ln(y^h_{s,t+h})$ is the change in state economic activity at horizon h, $T^{B90}_{s,t}$ is a state-level treatment exposure for the bottom 90, $T^{T10}_{s,t}$ is a state-level treatment exposure for the top 10, $\boldsymbol{X}'_{s,t}$ is a vector of state and year-level controls, and $\delta_{t,h}$ and $\theta_{s,h}$ are horizon-specific year and state fixed effects. The path of state prices around federal tax shocks for bottom 90 and top 10 earners is described by the sequences of coefficients $\{\beta^{B90}_h\}^{j=4}_{j=-3}$ and $\{\beta^{T10}_h\}^{j=4}_{j=-3}$, respectively. Following Zidar (2019), controls include mechanical changes in Aid to Families with Dependent Children (AFDC), Temporary Assistance for Needy Families (TANF), Supplemental Nutrition Assistance Program (SNAP), Supplemental Security Insurance (SSI), and Medicaid spending as a percentage of state GDP, and cyclicality-quintile year fixed effects. These summarize the effect of a 1 percent of state GDP change in personal income tax liabilities on a percent change in prices.

[7] There are a subset of tax changes I was unable to find newspaper reporting on and therefore, unable to classify.

IV EFFECT OF TAX CHANGES

IV.A Impact of State Taxes on Inflation

Figure 2 shows the evolution of prices in treated states after a *state-level* tax shock, relative to control states. Estimates from the difference-in-differences specification (1) in year j for the bottom 90, $\hat{\beta}_j^{B90}$, or top 10, $\hat{\beta}_j^{T10}$, are shown in blue and orange, respectively. Non-tradable prices are shown in panel A, tradable prices in panel B, and house prices in panel C. Regression estimates are also reported in table 2.

Panel A of figure 2 shows non-tradable prices are 1.5 percent lower in treated states after a 1 standard deviation increase in average tax rates for the bottom 90 percent, relative to control states in the 3 years following the tax change. Non-tradable prices do not respond to tax increases for the top 10 percent. Panel B shows tradable prices do not fall following tax increases for both the top 10 and bottom 90 percent income groups. Panel C shows house prices decrease by 15 percent following tax hikes for the bottom 90 percent and 10 percent following tax hikes for the top 10 percent. Since housing is a leveraged asset, the large response of house prices likely reflects sensitivity of housing to the decreased ability-to-pay of households following a tax increase. Aaronson et al. (2012) finds households cut down on their durables consumption following a permanent decrease in income, implying purchases of durables such as vehicles or housing are sensitive to changes in after-tax income.

On aggregate, I find a 1 percentage point increase in state income average tax rates decreases prices by approximately 2.5 percent for the bottom 90 percent and 1.5 percent for the top 10 percent. Specifically, since non-tradable goods, tradable goods, and housing each account for roughly 33 percent of the total consumer price index, this yields a weighted-average aggregate price decrease of 5 percent ($\approx \frac{1}{3} \cdot 1.5 + \frac{1}{3} \cdot 0 + \frac{1}{3} \cdot 15$) and 3 percent ($\approx \frac{1}{3} \cdot 0 + \frac{1}{3} \cdot 0 + \frac{1}{3} \cdot 10$) for a 2 percentage point average tax rate increase for the bottom 90 percent and top 10 percent, respectively.

To examine the plausibility of these aggregate price estimates, I re-estimate specification (1) for other prices indices, and report these estimates in figure A.3. I show a consistent picture that a 1 standard deviation increase in state taxes for the bottom 90 decreases aggregate prices by approximately 2 to 5 percent, as measured by the

ACCRA cost-of-living index in panel A, Moretti (2013) index based on national CPI and not including house prices in panel B, the BLS city price index in panel C, and the BEA regional index available from 2008 in panel D. Aggregate prices exhibit smaller decreases, not exceeding 2 percent, following tax increases for the top 10 percent.

IV.B Mechanisms and Discussion of Results

The results in Section 4.1 show non-tradable and house prices decline following tax increases. This result is a reduced form estimate that reflect changes in labor supply and demand, government spending and household consumption following tax changes. This section discusses the effects of *state* tax changes for lower and top-income groups on economic activity and compares my estimates to the fiscal multiplier literature. I present evidence from an analysis of *federal* tax changes, which support my main findings from studying state tax changes and avoids the issue of cross-state spillovers.

Figure 3 shows estimates of the effect of state tax changes for different groups on employment, hours worked, real wages, net migration rates, consumption, and output, from specification (1). These estimates are reported in table A.1. On the extensive margin, an increase of 1 standard deviation, or 2 percentage points, of the average tax rate decreases employment by 2.5 percent for the bottom 90 percent and by 1 percent for the top 10 percent in panel A. On the intensive margin, for both income groups, hours worked falls by 1 percent in panel B and wages decrease following tax increases in panel C. The decrease suggests labor demand responses may dominate labor supply responses to tax changes. The rate of out-migration increases by 0.3 percentage points for the bottom 90 percent and does not increase for the top 10 percent in panel D. The small migration responses following state tax changes suggest the potential concern of cross-state spillovers is small, especially since treated states are also situated away from control states with zero taxes, such as Alaska, Texas, and Washington. Consumption appears to fall in panel E, as does GDP in panel F following a 1 standard deviation tax increase for the bottom 90 and top 10, however, these estimates are noisy.

The reduced-form results of state tax changes on employment are within the range of estimates in existing papers on the fiscal multiplier. The estimate of a 2.5 percent increase in employment following a 1 standard deviation average tax rate cut for the bottom 90 translates to roughly $25,000 per job.[8] The cost per job estimate is similar to those reported in Ramey (2011) and Chodorow-Reich (2019), which range from $20,000 in Adelino et al. (2017), $30,000 in Serrato and Wingender (2016) to $50,000 in Chodorow-Reich (2019). Moreover, the estimate of a 2 percent increase in state GDP from a 1 standard deviation average tax rate cut for the bottom 90 translates to a government spending multiplier of 3.7.[9] The average multiplier in the literature is 2.1, according to a recent survey by Chodorow-Reich (2019), although studies such as Auerbach and Gorodnichenko (2012) and Leduc and Wilson (2017) estimate multipliers up to 3.6 and 6.6, respectively. One reason the estimate falls at the upper range of previous estimates in the literature is because past papers have focused on deficit-financed, transitory changes to government spending to estimate the multiplier, whereas I exploit tax-financed, permanent shocks to government spending. The quasi-experimental variation is cleaner than variation available in time series and potentially has stronger effects. A second reason is my estimate is a regional multiplier which tends to be larger than national multipliers (Chodorow-Reich, 2019); time fixed effects absorb the effects of counter-cyclical monetary policy that may dampen the national fiscal multiplier. Since the confidence intervals for GDP are large, I cannot rule out null or smaller effects.

This study shows that state tax increases for the bottom 90 decreases non-tradable and house prices, with no effect on tradable prices. Decreased consumer demand following a tax hike, which results from fewer working individuals working fewer hours, appears to be the primary mechanism driving lower non-tradable and house prices following tax increases on the bottom 90 percent. Tradable prices are unaffected as tradable industries, such as manufacturing, can redirect their products to other states or countries not experiencing demand contractions.

Non-tradable prices do not respond to tax increases for the top 10 percent, as high-income individuals have lower marginal propensities to consume and are not credit constrained. Thus, their consumption patterns are not as responsive to tax changes,

[8] Using 2019 numbers, a 1 standard deviation average tax rate cut is approximately a $300 per capita tax decrease in panel A of figure A.1. The U.S. population in 2019 was 330 million, so the tax cut is roughly $\$300 \cdot 330M = \$99,000M$. A 2.5 percent increase in employment on a base of $160 million is $4 million. Therefore, the cost per job is $99,000M/$4M= $24,750.

[9] A 1 standard deviation tax cut is roughly equal to $300 per capita, and a 2 percent increase in GDP, in panel F of figure 3, on a base of $55,000 per capita is $1,100 per capita. Therefore, the multiplier is $1,100/$300 = 3.7.

compared to the bottom 90 percent. House prices do fall following tax increases for the top 10 percent, which may reflect decreased ability-to-pay from lower employment.

Analysis of federal income tax shocks provides additional insight into the mechanisms behind price responses to tax changes. I use a direct projections approach, leveraging federal tax exposure shocks from Zidar (2019) at the year-state-income-group-level; the estimates are shown in figure A.4. The findings suggest that a 1 percent of state GDP tax cut for the bottom 90 percent results in 5 percent growth in non-tradable prices in panel A, no growth in tradable prices in panel B, and 10 percent growth in house prices in panel C, over a 4-year period. Figure A.5 shows a 1 percent of state GDP tax cut for the bottom 90 percent leads to a 10 percent increase in the employment-to-population ratio in panel A, 2 percent higher hours worked in panel B, and 1 percent lower wages in panel C. Decreased wages suggests labor demand outweighs supply responses following a federal tax cut. Consumption increases by 5 percent in panel E and state GDP by 10 percent in panel F for a tax cut for lower-income households. In contrast, a 1 percent of state GDP tax cut for the top 10 percent has no detectable or economically meaningful effect on prices or economic activity, in line with Zidar (2019). Federal taxes do not drive cross-state migration, so the finding that federal tax increases also lower non-tradable and house prices imply labor responses are a key channel driving consumer demand responses to tax changes.

IV.C Threats to Validity and Robustness

There are two primary threats to the validity of the estimates. The first concern is state tax changes may endogenously respond to changing or anticipated economic conditions. The second concern is state tax changes are often accompanied by contemporaneous changes to government spending or other taxes.

To address the first concern, I examine the "parallel trends" assumption that in the absence of the tax change, the outcomes for treated and controls states would have trended in parallel. To test this assumption, I show non-tradable, tradable, and house prices do not exhibit pre-trends in the period before the tax change in figure 2. Pre-trends are also absent for other outcomes of interest, such as employment, migration, and consumption in figure 3 or government expenditures in A.2, suggesting the identifying assumption of "parallel trends" for a causal interpretation of state tax rate changes is valid. For further robustness, I re-estimate specification (1) on aggregate prices, a weighted average of the non-tradable, tradable and house price indices, using a smaller set of state income tax changes which I categorize as "exogenous". Exogenous tax changes are identified as those that are driven by budget deficits or long-term objectives. The estimates in columns 1 and 2 of table A.2 suggest a 1 standard deviation, or 2 percentage point, increase in taxes decrease aggregate prices by 15 percent for the bottom 90 and by 6 percent for the top 10 percent, respectively. These results are noisy, due to the smaller set of tax changes in the sample. Expanding the set of tax changes to those that are either exogenous or unclassified, I find results supporting my baseline result, whereby a 1 standard deviation increase in the average tax rate lowers prices by 8 percent for the bottom 90 percent and 3.5 percent for the top 10 percent, shown in columns 3 and 4.

I perform several exercises to address the second concern that personal income tax changes occur alongside changes to government spending or other tax changes. First, I re-run specifications of equation (1) dropping tax shocks which occur for both the top 10 and bottom 90 in the same state and year to identify "unique" tax changes. I report the estimates in columns 5 and 6 of table A.2. I also limit the set of state tax shocks to "isolated" shocks, for which states have stable tax rates two years before and after the tax event of interest, and present estimates in columns 7 and 8. Although noisy, estimates from these exercises suggest prices decrease in response to tax increases, and these effects are larger following tax changes for the bottom 90 percent.

Second, I examine tax revenue and spending responses to state tax changes, to assess whether there are contemporaneous changes to government activity. Figure A.1 shows estimates of state income tax shocks on various tax revenues, from specification (1). Outcomes are measured in levels, not logs, to compare magnitudes. I find an increase of $300 per capita in personal tax revenues following a tax increase for the bottom 90 and top 10, corroborating my discussions on the timing and size of the state taxes, but no evidence of simultaneous large decreases in corporate, property or sales tax revenues. Thus, it does not appear as though increases in personal income taxes are used to reduce dependence on other types of taxes to raise government tax revenues. Figure A.2 shows estimates of the effect of state tax shocks on government spending. Government spending increases up to $250 per capita following taxes for the top 10, which appears to be driven by increased spending on welfare. I do not find evidence of large changes in government spending following tax changes for the bottom 90, suggesting taxes may be introduced for exogenous reasons related to budget deficits or long-run growth. Finally, I re-estimate specification (1), including controls for government spending in columns 9 and 10 of table A.2. My results appear robust to the inclusion of these controls.

V CONCLUSION

This paper documents the effect of tax changes on inflation. Using novel measures of state non-tradable and tradable prices and leveraging variation from state and federal tax shocks, I estimate the effect of tax changes for the bottom 90 and top 10 percent income groups. I find a 1 standard deviation, or 2 percentage point, decrease in the state average income tax rate increases non-tradable prices by 1.5 percent and house prices by 15 percent, with no effect on tradable prices for taxes on the bottom 90 percent. Similarly a 1 standard deviation tax cut for the top 10 percent increases house prices by 10 percent, with no effect on tradable or house prices. These results translate into 2.5 percent and 1.5 percent higher aggregate prices for 1 percentage point decreases in average tax rates for lower-income and higher-income households, respectively. Increased consumer demand and employment are the main drivers of higher prices following tax cuts.

These findings have important implications for fiscal policy. The study suggests that tax cuts are not a suitable instrument to help households weather rising inflationary pressures in the short to medium run. Indeed, tax cuts are likely counterproductive to the goal of lowering prices. Labor supply responses to tax cuts can increase consumer demand, leading counter-productively to higher prices. Therefore, policymakers should consider other tools to support households in the face of inflation.

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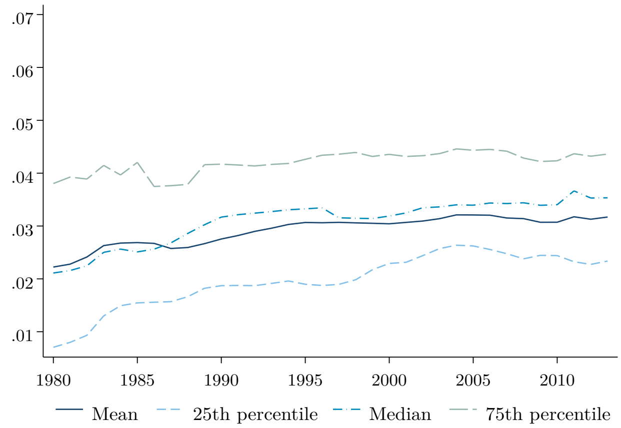
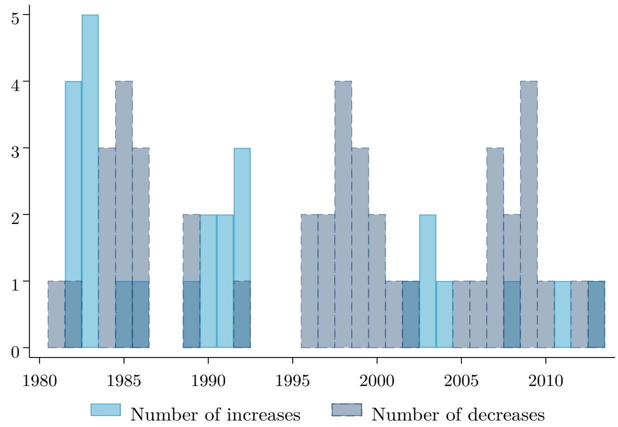
VI FIGURES & TABLES

FIGURE 1: State Personal Income Tax Rates and Changes Over Time

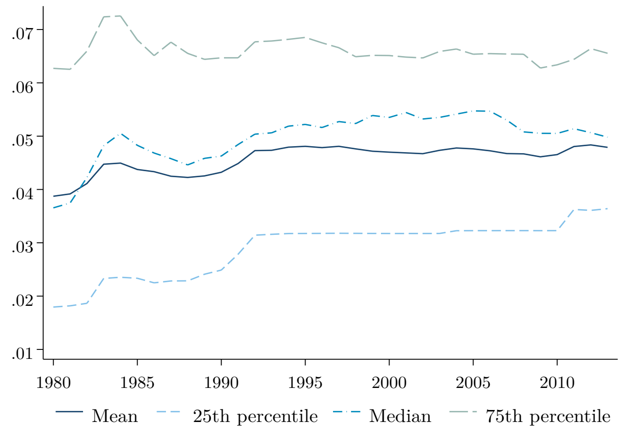
(A) Average Tax Rates for Bottom 90



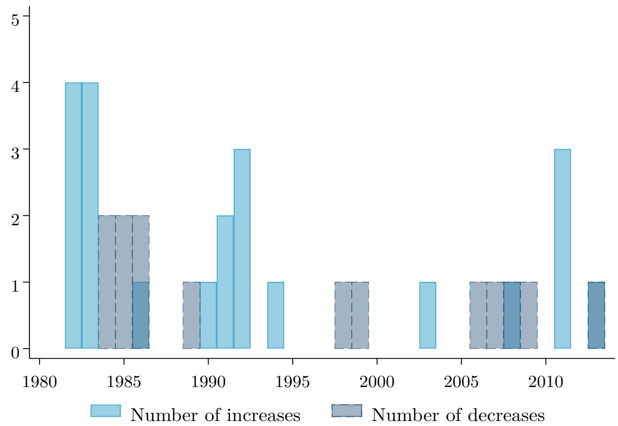
(B) Tax Changes for Bottom 90



(C) Average Tax Rates for Top 10

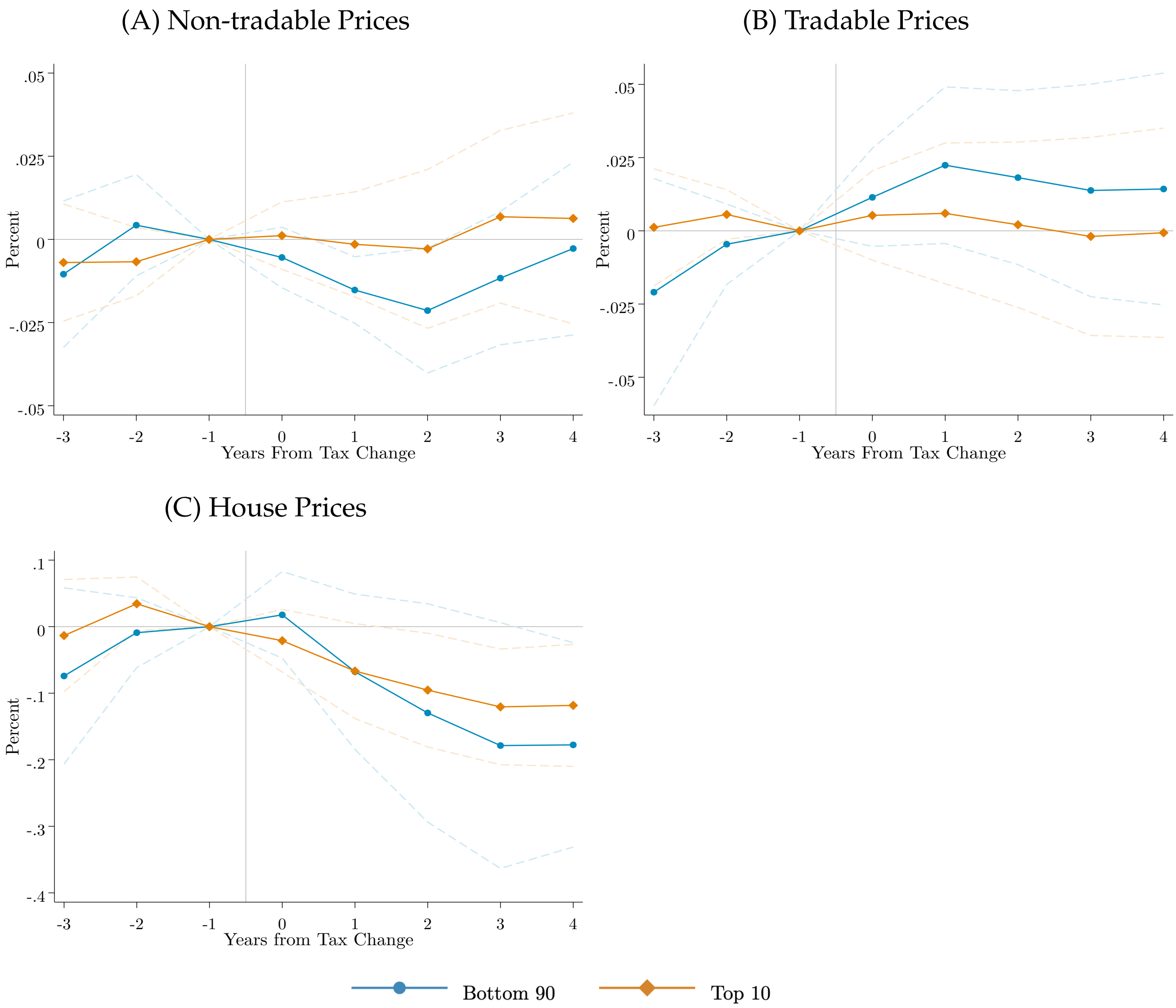


(D) Tax Changes for Top 10



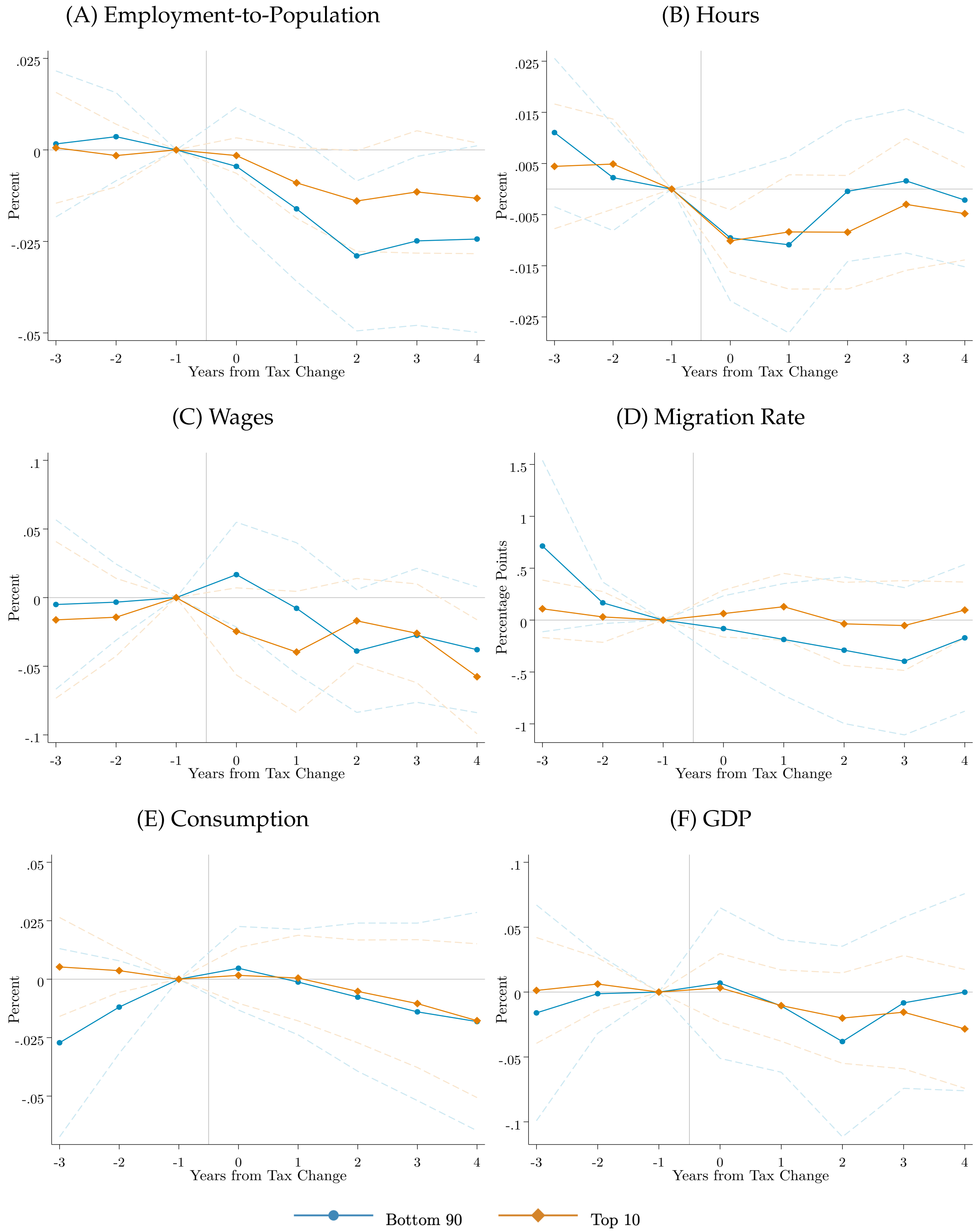
Notes: Panels A and B plot the evolution of the mean and quartiles of personal income average tax rates for the bottom 90 percent and top 10 percent, respectively, across 28 sample states from 1980 to 2013. Panels C and D plot the number of changes in the personal income tax rate for the bottom 90 percent and top 10 percent by year, respectively.

FIGURE 2: The Effect of State Income Tax Changes on Inflation



Notes: This figure presents difference-in-differences estimates of specification (1) for a 1 standard deviation increase in state income average tax rates in year j on prices for the bottom 90 percent, β_j^{B90}, and top 10 percent, β_j^{T10}. Dependent price measures include Hazell et al. (2022)'s non-tradable (panel A) and tradable (panel B) price index, and the FHFA state house price index (panel C). Each component accounts for roughly one-third of the consumer price index (CPI). Controls include the state unemployment rate, per capita income, GDP, and population. Standard errors are robust and clustered by state. 95 percent confidence intervals are shown as dashed lines. The sample period is 1978 to 2017.

FIGURE 3: The Effect of State Income Tax Changes on Labor Market Outcomes, Migration, Consumption and GDP



Notes: This figure presents difference-in-differences estimates from specification (1) for a 1 standard deviation increase in state income average tax rates in year j on state economic activity outcomes for the bottom 90 percent, β_j^{B90}, and top 10 percent, β_j^{T10}. Controls include the state unemployment rate, per capita income, GDP, and population. Outcomes include the employment-to-population ratio shown in panel A, hours worked among those who have worked at least 48 weeks in the past year in panel B, real composition-constant average wages in panel C, net migration rate (in percentage points) in panel D, state consumption in panel E, and state GDP in panel F. Standard errors are robust and clustered by state. 95 percent confidence intervals are shown as dashed lines. The sample period is 1978 to 2017.

TABLE 1: Summary Statistics

	Bottom 90			Top 10		
	(1) All	(2) Treated	(3) Control	(4) All	(5) Treated	(6) Control
Non-tradable Prices	163.75	164.59	163.60	175.27	173.97	175.53
	(25.29)	(25.21)	(25.31)	(24.48)	(23.13)	(24.75)
Tradable Prices	125.87	122.53	126.43	131.24	131.10	131.27
	(11.88)	(9.91)	(12.09)	(12.80)	(13.96)	(12.57)
House Prices	269.36	271.05	269.08	303.22	374.26	289.02
	(84.50)	(77.12)	(85.70)	(102.08)	(146.00)	(84.08)
Employment-to-Population	62.47	63.01	62.38	61.51	61.91	61.43
	(3.66)	(4.66)	(3.46)	(3.57)	(3.64)	(3.56)
Hours	2,134.05	2,118.08	2,136.73	2,122.60	2,098.33	2,127.45
	(37.10)	(39.97)	(35.93)	(38.34)	(35.49)	(37.06)
Wages	22.99	22.53	23.07	23.29	23.77	23.20
	(1.89)	(2.41)	(1.78)	(2.06)	(2.88)	(1.84)
Migration Rate	0.23	0.04	0.26	0.17	-0.21	0.25
	(0.42)	(0.49)	(0.40)	(0.43)	(0.41)	(0.39)
Consumption	362,239.70	188,668.60	391,377.34	397,405.61	322,718.80	412,342.97
(millions)	(292702.37)	(138640.29)	(301568.48)	(317594.50)	(307178.20)	(317870.28)
GDP Per Capita	56,915.87	53,463.58	57,495.42	59,112.03	58,769.35	59,180.56
	(11,847.91)	(8,373.63)	(12,243.13)	(13,038.80)	(9,923.78)	(13,584.61)
Unemployment Rate	6.12	5.36	6.25	6.73	6.12	6.85
	(1.85)	(1.91)	(1.80)	(1.95)	(1.96)	(1.93)
Income	45,955.03	45,704.57	45,997.08	47,447.88	49,224.01	47,092.65
	(5,152.55)	(6,453.98)	(4,902.26)	(5,924.65)	(8,417.51)	(5,228.33)
Population	9,882.00	5,192.44	10,669.24	10,562.84	8,070.71	11,061.26
(thousands)	(8,036.54)	(3,799.42)	(8,289.03)	(8,500.19)	(7,323.88)	(8,637.78)
Personal Income Taxes	174.46	1,164.77	8.22	255.22	1,490.85	8.09
	(428.91)	(364.10)	(16.82)	(587.09)	(482.99)	(16.61)
Corporate Income Taxes	252.88	146.26	270.78	272.87	167.12	294.02
	(411.19)	(66.55)	(441.04)	(442.84)	(78.97)	(481.13)
Government Expenditures	7,712.01	6,790.72	7,866.67	8,106.66	7,941.51	8,139.69
	(4,644.75)	(1,240.27)	(4,977.40)	(4,713.93)	(1,692.71)	(5,108.91)
Observations	1,454	209	1,245	534	89	445

Notes: This table presents summary statistics at the state-year level, for the bottom 90 percent (columns 1 to 3) and top 10 percent (columns 4 to 6). Summary statistics for all states are presented in columns 1 and 4, for treated states, who enacted a large tax change, in columns 2 and 5, and for control states, who do not have state personal income taxes, in columns 3 and 6. Hours worked are for those who have worked at least 48 weeks in the past year. Wages are real and composition constant. Taxes and expenditures are reported on a per capita basis. The CPI base year is 1989. Dollars are reported in 2019 real dollars. The sample period is 1978 to 2017.

TABLE 2: The Effects of State-Level Tax Changes for Different Income Groups

	A. Bottom 90			B. Top 10		
	(1) Nontradables	(2) Tradables	(3) Housing	(4) Nontradables	(5) Tradables	(6) Housing
Independent Variable: $\Delta ATR \times$ Year Relative to Tax Shock						
-3	-1.05	-2.09	-7.40	-0.70	0.12	-1.34
	(1.12)	(1.98)	(6.75)	(0.90)	(1.02)	(4.30)
-2	0.43	-0.46	-0.90	-0.67	0.56	3.44
	(0.78)	(0.70)	(2.67)	(0.52)	(0.43)	(2.05)
-1	-	-	-	-	-	-
0	-0.54	1.14	1.78	0.11	0.53	-2.10
	(0.46)	(0.85)	(3.32)	(0.52)	(0.78)	(2.40)
1	-1.52	2.24	-6.77	-0.15	0.60	-6.67
	(0.51)	(1.36)	(5.95)	(0.80)	(1.23)	(3.64)
2	-2.14	1.82	-12.96	-0.29	0.21	-9.53
	(0.96)	(1.52)	(8.37)	(1.22)	(1.44)	(4.36)
3	-1.16	1.38	-17.86	0.68	-0.19	-12.05
	(1.02)	(1.85)	(9.42)	(1.32)	(1.73)	(4.43)
4	-0.27	1.43	-17.76	0.63	-0.07	-11.83
	(1.33)	(2.02)	(7.84)	(1.62)	(1.82)	(4.68)
Observations	3,237	3,237	2,997	1,644	1,644	1,404
R^2	0.995	0.948	0.944	0.995	0.947	0.948

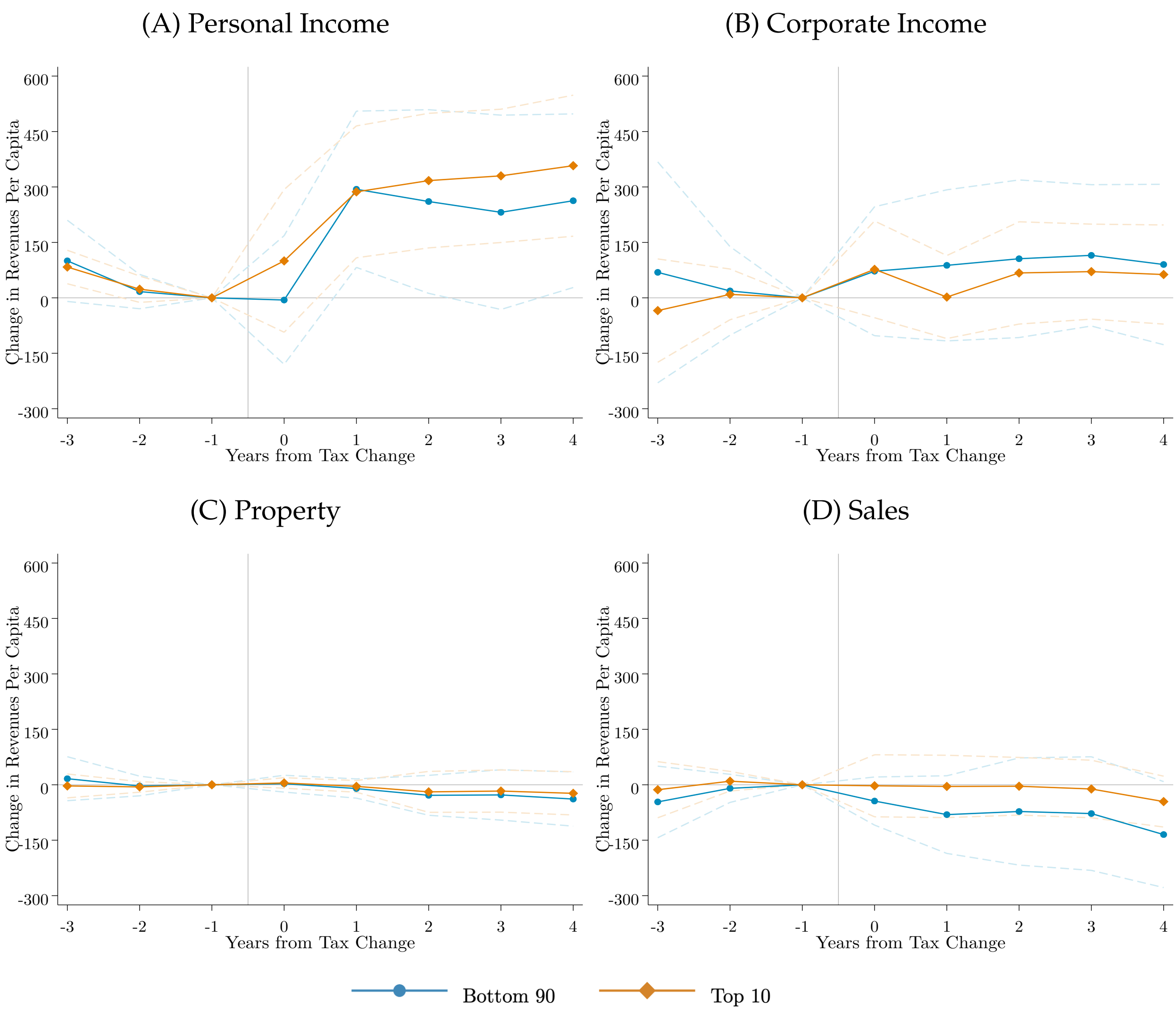
Notes: This table presents estimates of the effect of tax changes on prices, β_j^g, for the bottom 90 percent in panel A and for the top 10 percent in panel B, from the following specification:

$$ln(y_{s,t}^h) = \alpha_0 + \sum_{j=3,\neq -1}^{4} \beta_j^g \Delta \text{tax}_s^g \times \mathbf{1}_{\{P_t=j\}} + \boldsymbol{X}_{s,t}'\boldsymbol{\Gamma} + \delta_t + \theta_s + \varepsilon_{ct}$$

where g $\in$ {Bottom 90,Top 10}, and s and t index state and year. $ln(y_{s,t}^h)$ is the log of the state economic activity outcome of interest, Δtax_s^g measures a 1 standard deviation increase in the average tax rate of income group g and, $\mathbf{1}_{\{P_t=j\}}$ is an indicator that equals to 1 if t is j years away from the treatment year, and $\boldsymbol{X}_{s,t}'$ is a vector of state and year-level controls, including the unemployment rate, per capita income, GDP, and state population. Specifications include year fixed effects δ_t and state fixed effects θ_s. Standard errors are robust and clustered by state, and reported in parentheses. Data are at the state-year level from 1978 to 2017.

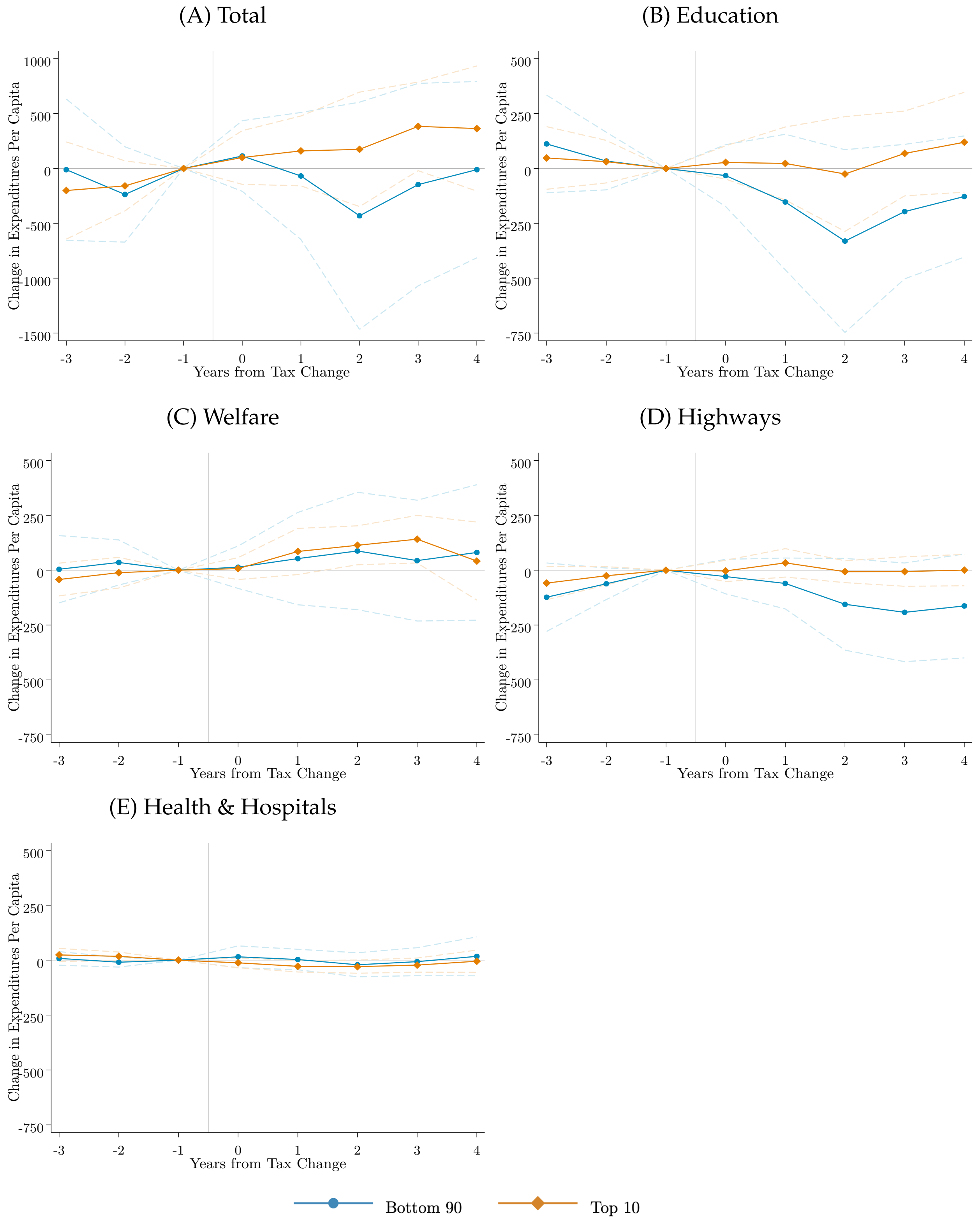
A APPENDIX

FIGURE A.1: The Effect of State Income Tax Changes on Types of Tax Revenues



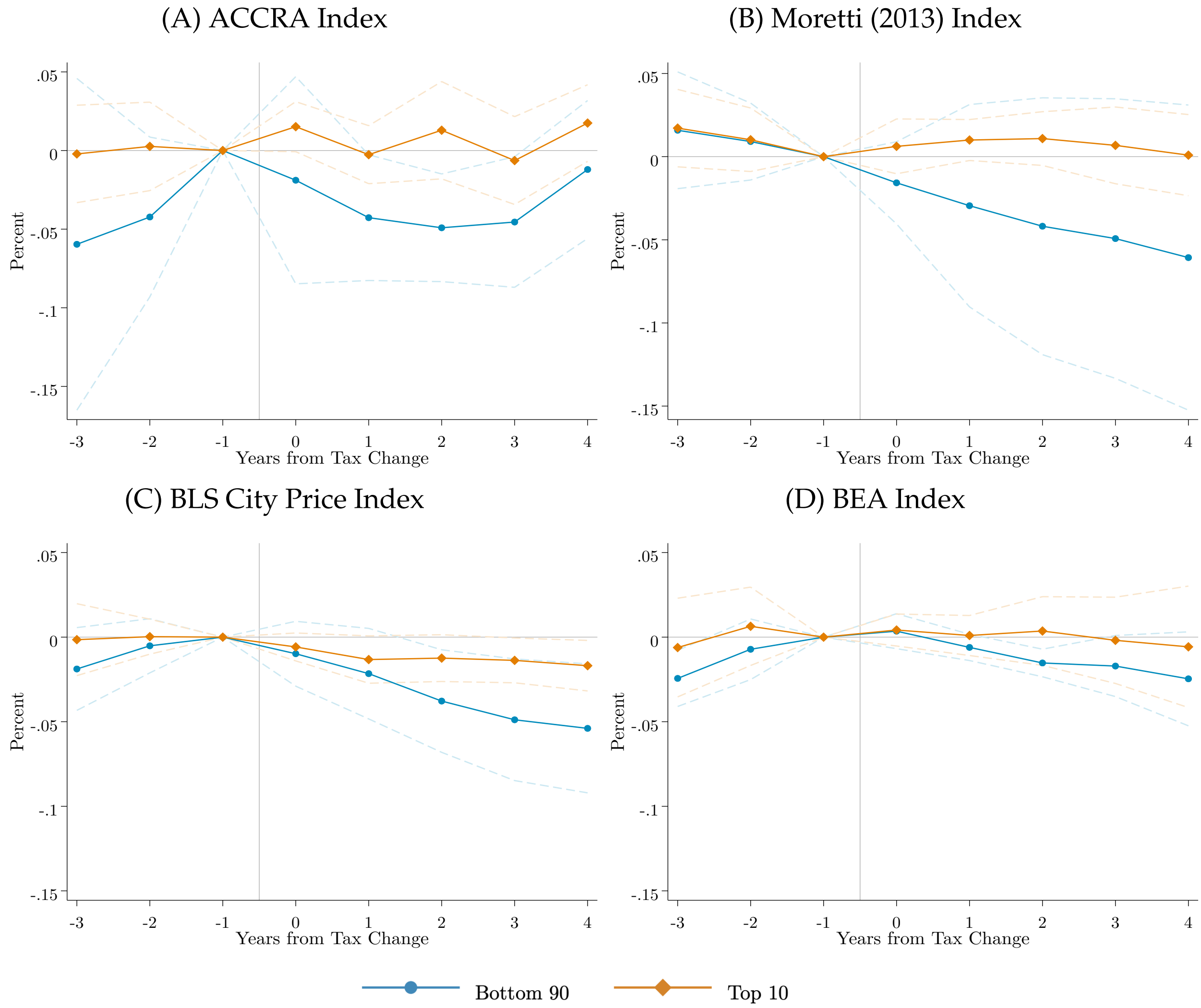
Notes: This figure presents estimates from the difference-in-differences specification of equation (1) for a 1 standard deviation increase in state income average tax rates in year j on state tax revenues for the bottom 90 percent, β_j^{B90}, and top 10 percent, β_j^{T10}. Tax revenues are measured in 2019 real dollars, on a per capita basis. Controls include the state unemployment rate, per-capita income, GDP, and population. Standard errors are robust and clustered by state. 95 percent confidence intervals are shown as dashed lines. The sample period is 1978 to 2017.

FIGURE A.2: The Effect of State Income Tax Changes on Government Spending



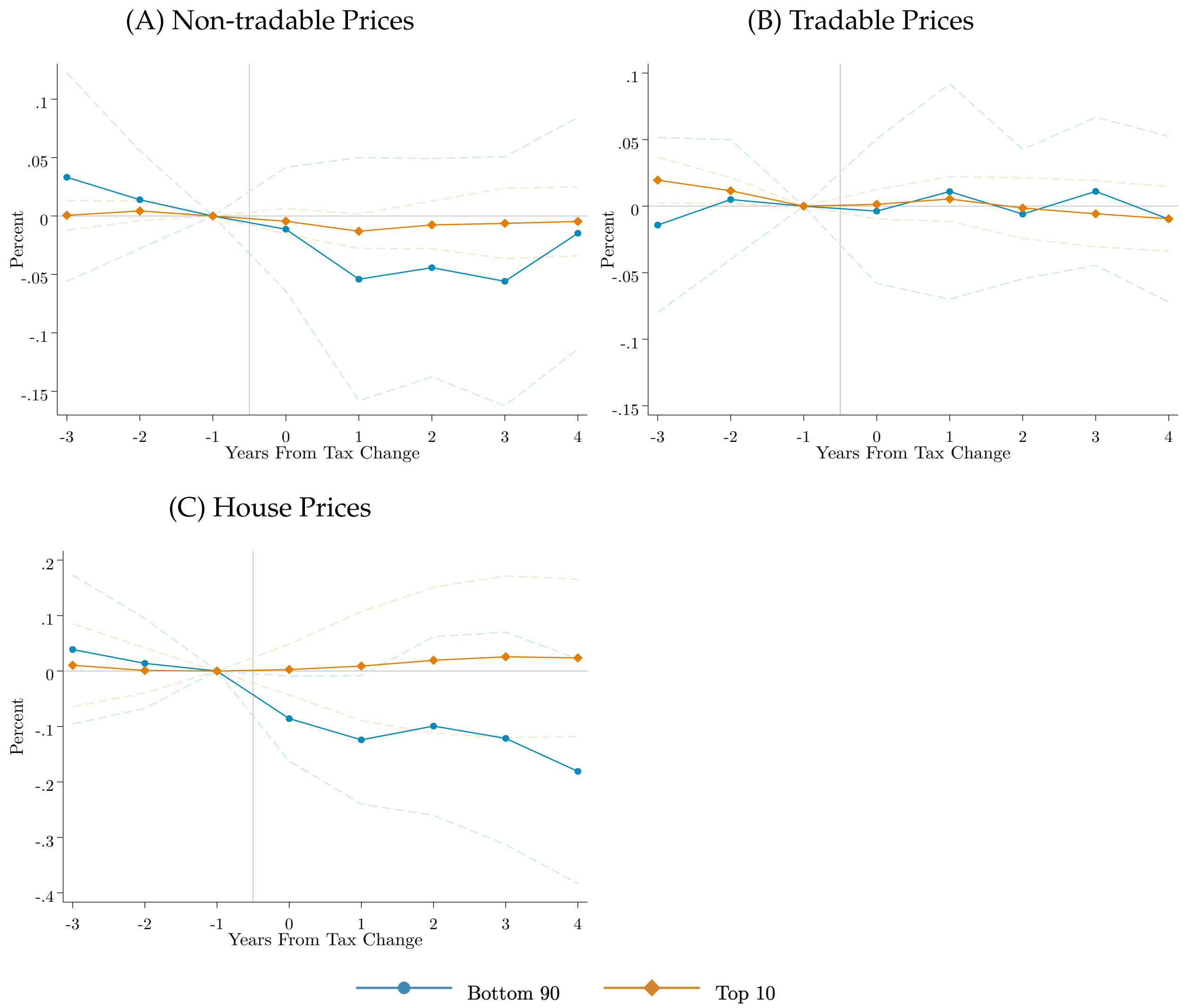
Notes: This figure presents estimates from the difference-in-differences specification of equation (1) for a 1 standard deviation increase in state income average tax rates in year j on state expenditures for the bottom 90 percent, β_j^{B90}, and top 10 percent, β_j^{T10}. Expenditures are measured in 2019 real dollars, on a per capita basis. Controls include the state unemployment rate, per-capita income, GDP, and population. Standard errors are robust and clustered by state. 95 percent confidence intervals are shown as dashed lines. The sample period is 1978 to 2017.

FIGURE A.3: The Effect of State Income Tax Changes on Inflation, Using Alternative Price Indexes



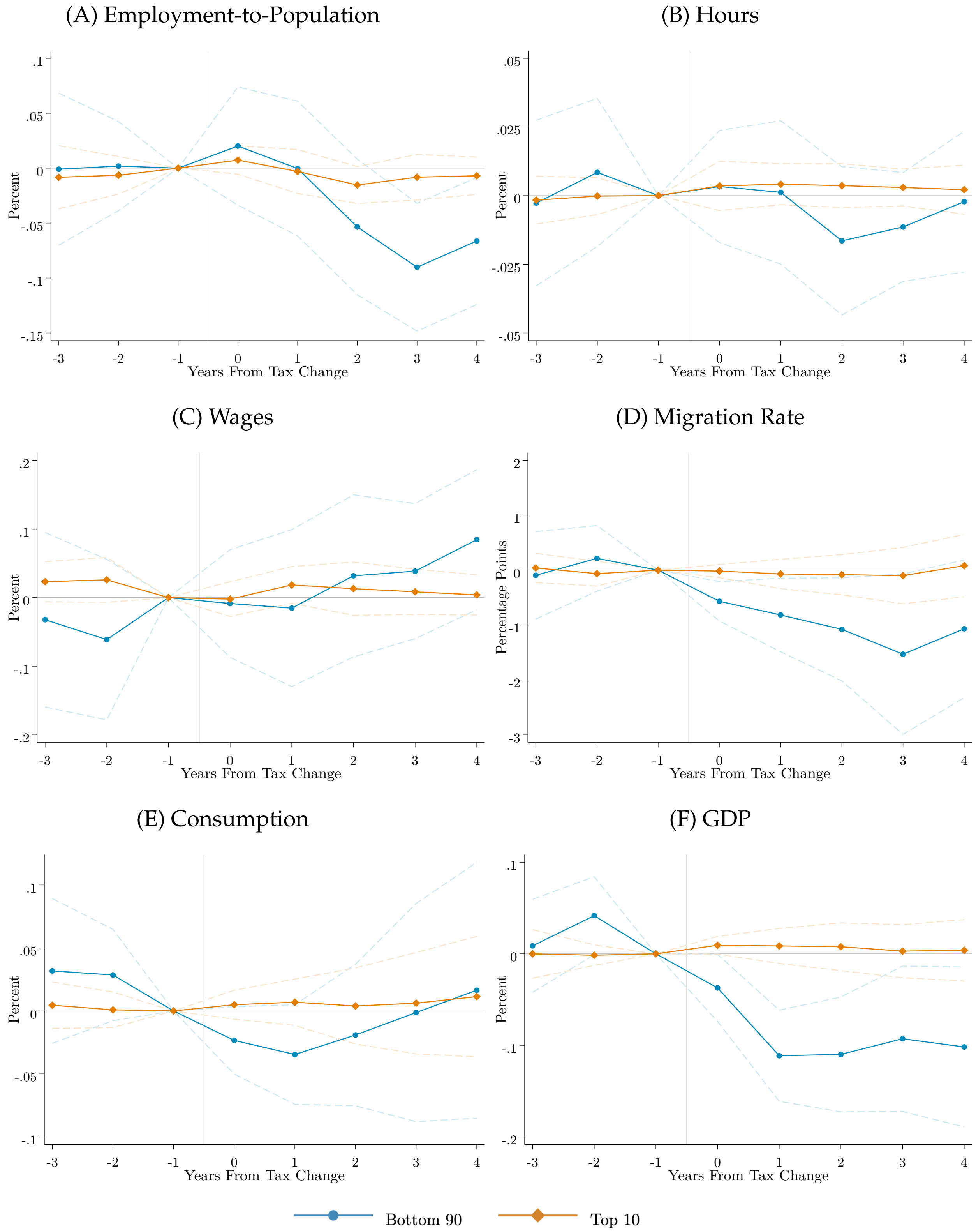
Notes: This figure presents estimates from the difference-in-differences specification of equation (1) for a 1 standard deviation increase in state income average tax rates in year j on various price indices for the bottom 90 percent, β_j^{B90}, and top 10 percent, β_j^{T10}. Controls include the state unemployment rate, per-capita income, GDP, and population. These outcomes are the American Chamber of Commerce Researchers Association (ACCRA) cost-of-living index in panel A, Moretti (2013) index based on national CPI in panel B, Bureau of Labor Studies (BLS) city price index in panel C, Bureau of Economic Analysis (BEA) price index in panel D. Standard errors are robust and clustered by state. 95 percent confidence intervals are shown as dashed lines. The sample period is 1978 to 2017 for all panels, except for panel E for which the sample period is 2008 to 2017, as the BEA price index is available starting from 2008.

FIGURE A.4: The Effect of *Federal* Income Tax Changes on Inflation



Notes: The figure presents direct projection estimates from specification (2) for a 1 percent of state GDP increase in federal income average tax rates in year h on prices for the bottom 90 percent, β_h^{B90}, and top 10 percent, β_h^{T10}. Dependent price measures include Hazell et al. (2022)'s non-tradable (panel A) and tradable (panel B) price index, and the FHFA state house price index (panel C). Controls include mechanical changes in AFDC, TANF, SNAP, SSI, and Medicaid spending as a percentage of state GDP, and cyclicality-quintile year fixed effects. Standard errors are robust and clustered by state. 95 percent confidence intervals are shown as dashed lines. The sample period is 1978 to 2017.

FIGURE A.5: The Effect of *Federal* Income Tax Changes on Labor Market Outcomes, Migration, Consumption and GDP



Notes: This figure presents direct projection estimates from specification (2) for a 1 percent of state GDP increase in federal income average tax rates in year h on prices for the bottom 90 percent, β_h^{B90}, and top 10 percent, β_h^{T10}. Controls include mechanical changes in AFDC, TANF, SNAP, SSI, and Medicaid spending as a percentage of state GDP, and cyclicality-quintile year fixed effects. Outcomes include the employment-to-population ratio shown in panel A, hours worked among those who have worked at least 48 weeks in the past year in panel B, real composition-constant average wages in panel C, net migration rate (in percentage points) in panel D, state consumption in panel E, and state GDP in panel F. Standard errors are robust and clustered by state. 95 percent confidence intervals are shown as dashed lines. The sample period is 1978 to 2017.

TABLE A.1: The Effects of State-Level Tax Changes on Economic Activity and Labor Outcomes for Different Income Groups

	A. Bottom 90						B. Top 10					
	(1) Employment-to-Pop	(2) Hours	(3) Wages	(4) Migration	(5) Consumption	(6) GDP	(7) Employment-to-Pop	(8) Hours	(9) Wages	(10) Migration	(11) Consumption	(12) GDP
Independent Variable: $\Delta ATR \times$ Year Relative to Tax Shock												
-3	0.16	1.10	-0.50	0.68	-2.71	-1.60	0.06	0.44	-1.62	0.09	0.45	0.13
	(1.02)	(0.74)	(3.15)	(0.43)	(2.10)	(4.24)	(0.77)	(0.62)	(2.91)	(0.14)	(1.05)	(2.08)
-2	0.36	0.22	-0.33	0.16	-1.19	-0.12	-0.16	0.49	-1.43	0.02	0.35	0.62
	(0.61)	(0.53)	(1.41)	(0.10)	(1.03)	(1.56)	(0.44)	(0.45)	(1.44)	(0.12)	(0.48)	(1.04)
-1	-	-	-	-	-	-	-	-	-	-	-	-
0	-0.45	-0.95	1.68	-0.08	0.47	0.69	-0.15	-1.01	-2.46	0.07	0.17	0.33
	(0.82)	(0.63)	(1.95)	(0.16)	(0.92)	(2.96)	(0.25)	(0.31)	(1.62)	(0.11)	(0.61)	(1.35)
1	-1.61	-1.09	-0.78	-0.20	-0.12	-1.07	-0.90	-0.84	-3.96	0.13	0.05	-1.04
	(1.01)	(0.88)	(2.44)	(0.28)	(1.16)	(2.61)	(0.49)	(0.57)	(2.25)	(0.17)	(0.91)	(1.40)
2	-2.90	-0.04	-3.89	-0.33	-0.76	-3.81	-1.40	-0.84	-1.69	-0.04	-0.54	-2.00
	(1.04)	(0.70)	(2.28)	(0.38)	(1.53)	(3.75)	(0.70)	(0.57)	(1.57)	(0.21)	(1.12)	(1.78)
3	-2.49	0.16	-2.74	-0.44	-1.39	-0.83	-1.15	-0.30	-2.60	-0.06	-1.09	-1.55
	(1.18)	(0.72)	(2.49)	(0.38)	(1.86)	(3.36)	(0.85)	(0.66)	(1.84)	(0.23)	(1.35)	(2.23)
4	-2.44	-0.21	-3.79	-0.21	-1.81	-0.01	-1.32	-0.48	-5.76	0.09	-1.82	-2.84
	(1.30)	(0.67)	(2.34)	(0.37)	(2.37)	(3.87)	(0.77)	(0.46)	(2.12)	(0.14)	(1.62)	(2.34)
Observations	3,272	3,093	2,853	1,728	1,200	3,237	1,664	1,548	1,513	672	528	1,644
R^2	0.939	0.745	0.825	0.737	1.000	0.996	0.942	0.731	0.828	0.744	1.000	0.995

Notes: This table presents the effect of tax changes, β_j^g, for the bottom 90 percent (panel A) and for the top 10 percent (panel B) from specification:

$$\ln(y_{s,t}^h) = \alpha_0 + \sum_{j=3,\neq -1}^{4} \beta_j^g \Delta \text{tax}_s^g \times \mathbf{1}_{\{P_t=j\}} + \boldsymbol{X}_{s,t}' \boldsymbol{\Gamma} + \delta_t + \theta_s + \varepsilon_{ct}$$

where g $\in$ {Bottom 90,Top 10}, and s and t index state and year. $ln(y_{s,t}^h)$ is the log of the state economic activity outcome of interest, Δtax_s^g measures a 1 standard deviation increase in the average tax rate of income group g and, $\mathbf{1}_{\{P_t=j\}}$ is an indicator that equals to 1 if t is j years away from the treatment year, and $\boldsymbol{X}_{s,t}'$ is a vector of state and year-level controls, including the unemployment rate, per capita income, GDP, and state population. Specifications include year fixed effects δ_t and state fixed effects θ_s. Standard errors are robust and clustered by state, and reported in parentheses. Data are at the state-year level from 1978 to 2017.

TABLE A.2: The Effects of State-Level Tax Changes on Aggregate Prices for Different Income Groups: Robustness

	Exogenous Shocks		Exogenous or Unclassified Shocks		Unique Tax Change		Isolated Tax Change		Government Spending Controls	
	(1) B90	(2) T10	(3) B90	(4) T10	(5) B90	(6) T10	(7) B90	(8) T10	(9) B90	(10) T10
Independent Variable: $\Delta ATR \times$ Year Relative to Tax Shock										
-3	2.82	2.11	-3.42	-0.73	-3.47	-0.85	-1.31	-2.62	-3.57	-0.24
	(3.31)	(1.94)	(2.96)	(2.20)	(4.08)	(2.56)	(2.82)	(2.24)	(2.90)	(2.33)
-2	2.01	2.16	-0.67	1.16	-2.07	1.23	-0.20	0.30	-0.72	1.35
	(2.52)	(0.92)	(1.16)	(0.92)	(1.35)	(1.38)	(1.06)	(1.19)	(1.16)	(0.95)
-1	-	-	-	-	-	-	-	-	-	-
0	-0.68	-1.14	0.82	-0.42	1.61	-0.04	1.22	-0.23	0.78	-0.50
	(1.73)	(0.85)	(1.21)	(0.81)	(1.36)	(1.24)	(1.68)	(1.07)	(1.22)	(0.84)
1	-4.81	-3.60	-2.83	-2.05	-1.53	0.12	-0.17	-1.64	-2.77	-2.12
	(2.94)	(1.10)	(2.25)	(1.45)	(2.51)	(2.13)	(2.79)	(1.98)	(2.20)	(1.45)
2	-9.10	-5.19	-6.46	-3.40	-5.13	-0.02	-3.24	-2.30	-6.26	-3.64
	(3.09)	(1.31)	(3.02)	(1.62)	(3.48)	(2.25)	(3.41)	(2.14)	(2.91)	(1.62)
3	-15.05	-6.24	-8.32	-3.70	-7.85	-0.83	-7.38	-3.00	-8.02	-4.32
	(7.71)	(1.89)	(3.96)	(1.65)	(3.62)	(1.96)	(6.61)	(2.19)	(4.00)	(1.80)
4	-8.04	-5.96	-8.92	-3.64	-9.62	-0.84	-11.03	-4.28	-8.67	-4.45
	(11.36)	(2.85)	(3.77)	(1.77)	(3.56)	(2.70)	(8.45)	(2.46)	(3.82)	(1.95)
Observations	236	503	3105	1524	2279	686	964	898	3153	1560
R^2	0.985	0.981	0.973	0.976	0.972	0.982	0.971	0.977	0.973	0.977

Notes: This table presents estimates of the effect of tax changes on aggregate prices from specification (1) for the bottom 90 (B90) and top 10 (T10) percent, using a subset of the tax changes. Estimates for "exogenous" shocks in columns 1 and 2, for "exogenous" and unclassified shocks in 3 and 4, for states with a "unique" income tax change on either the bottom 90 or top 10 in 5 and 6, for states who did not enact any tax changes two years before and after the main tax shock in 7 and 8, and including government expenditure controls in 9 and 10. Standard errors are robust and clustered by state, and reported in parentheses. Data are at the state-year level from 1978 to 2017.

TABLE A.3: The Effects of State-Level Tax Changes on Alternative Price Indices for Different Income Groups

	A. Bottom 90				B. Top 10			
	(1) ACCRA	(2) Moretti (2013)	(3) BLS	(4) BEA	(5) ACCRA	(6) Moretti (2013)	(7) BLS	(8) BEA
Independent Variable: ΔATR × Year Relative to Tax Shock								
-3	-5.96	1.59	-1.88	-2.44	-0.22	1.72	-0.15	-0.62
	(5.38)	(1.79)	(1.25)	(0.85)	(1.58)	(1.19)	(1.08)	(1.49)
-2	-4.23	0.91	-0.51	-0.72	0.26	1.02	0.03	0.64
	(2.59)	(1.18)	(0.82)	(0.91)	(1.44)	(0.97)	(0.53)	(1.18)
-1	-	-	-	-	-	-	-	-
0	-1.89	-1.57	-0.98	0.35	1.52	0.62	-0.58	0.42
	(3.36)	(1.26)	(0.98)	(0.53)	(0.81)	(0.84)	(0.42)	(0.48)
1	-4.27	-2.95	-2.16	-0.61	-0.26	1.00	-1.32	0.10
	(2.04)	(3.10)	(1.37)	(0.40)	(0.94)	(0.63)	(0.71)	(0.60)
2	-4.91	-4.18	-3.78	-1.53	1.29	1.09	-1.24	0.36
	(1.75)	(3.94)	(1.55)	(0.42)	(1.58)	(0.82)	(0.71)	(1.04)
3	-4.55	-4.93	-4.89	-1.71	-0.64	0.68	-1.37	-0.19
	(2.12)	(4.29)	(1.83)	(0.92)	(1.42)	(1.18)	(0.68)	(1.30)
4	-1.21	-6.07	-5.39	-2.46	1.75	0.09	-1.69	-0.57
	(2.24)	(4.68)	(1.95)	(1.42)	(1.24)	(1.25)	(0.76)	(1.83)
Observations	2440	816	1160	192	1088	432	560	240
R^2	0.946	0.988	0.993	0.982	0.936	0.992	0.994	0.981

Notes: This table presents difference-in-difference estimates of the effect of tax changes on alternative price indices for different income groups, the bottom 90 (panel A) and top 10 (panel B) percent. Other price indices are the ACCRA cost-of-living index in columns 1 and 5, the Moretti (2013) index in columns 2 and 6, the BLS city price index in columns 3 and 6, and the BEA regional index in columns 4 and 8. Standard errors are robust and clustered by state, and reported in parentheses. Data are at the state-year level from 1978 to 2017.